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Customer Number

Patent  
Case No.: 58878US002

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

First Named Inventor: HUMLICEK, LARRY D.  
Application No.: 10/657859 Confirmation No.: 2059  
Filed: September 9, 2003  
Title: APPARATUS AND METHOD FOR PRODUCING TWO-SIDED PATTERNED  
WEBS IN REGISTRATION

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**DECLARATION UNDER 37 C.F.R. §1.132**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

As permitted under 37 C.F.R. §1.132, I hereby declare as follows:

1. My name is Daniel H. Carlson, and I am a named inventor of the above-captioned United States Patent Application ("the present application").
2. I am employed by 3M Company. The assignee of the present application is 3M Innovative Properties, which is an affiliate of 3M Company.
3. I have been employed by 3M Company since 1989, and am currently a Senior Systems Specialist. In my capacity as Senior Systems Specialist, I develop new web handling processes to permit the manufacture of new 3M products.
4. I received a degree in Bachelor of Science in Electrical Engineering from the University of Minnesota in 1989.

5. In 1999, I was assigned to a design team at 3M Company that has been developing the apparatus of the present application ("the apparatus"). The aforementioned design team has been in place since at least 1999, has continuously worked toward development of the apparatus since at least 1999, and remains active today. Throughout this period of time, the development team had generally had multiple engineers assigned to it at any one time. Occasionally, an engineer has been transferred to another assignment. When that has occurred, another engineer has typically been assigned to the design team to fill that engineer's place.
6. During the development of the apparatus, the design team discovered various factors that had to be addressed, in order for the apparatus to exhibit registration between structures on opposite sides of a web to within 50 microns.
7. Amongst the factors referred to in paragraph 6, is the need for precise control of the rotational speed and position of the various driven rollers of the apparatus. If the rollers do not operate at almost exactly the correct speed, the web will experience tension and exhibit strain in the down-web direction. Thus, according to Poisson's ratio, the web will also exhibit a strain in the cross-web direction. In other words, the web will contract in the cross-web direction.
8. The cross-web contraction referred to in paragraph 7 is detrimental to achieving registration between structures on opposite sides of a web to within 50 microns.
9. The cross-web contraction referred to in paragraph 7 is ordinarily ignored, and is not detrimental to webs requiring only ordinary levels of registration.
10. To achieve precise control over the speed and position of the driven rollers, the design team pursued the development of an approach for obtaining precise information concerning the angular position of the driven rollers, a control loop for controlling motors

that drive the rollers, and a coupling scheme for coupling a motor to a roller with sufficient rotational accuracy.

11. With regard to obtaining precise information concerning the angular position of the driven rollers, the design team learned that the use of tachometers to observe the drive shafts of the various motors is insufficient to allow for registration between structures on opposite sides of a web to within 50 microns. It is believed that this insufficiency stems from the fact that tachometers measure angular velocity. To obtain angular position, the angular velocity must be integrated, thereby accumulating any error in the measurement. Moreover, measurements obtained solely at a drive shaft do not provide precise information concerning the position of a roller coupled thereto, because the coupling between a drive shaft and a roller is always, to some extent, mechanically imperfect.
12. To address the problems described in paragraph 11, the design team settled upon the use of high resolution precision encoders to observe both the drive shaft of a motor and the roller coupled thereto. This approach to gathering information concerning the motion of the rollers has proven to generate information sufficient to allow for registration between structures on opposite sides of a web to within 50 microns.
13. With regard to the development of a coupling scheme for coupling a motor to a roller with sufficient rotational accuracy, in about 2000 (and periodically since then), I personally conducted a search for the very best precision gear transmissions available. My search revealed not a single gear transmission that exhibited the rotational accuracy needed to achieve registration between structures on opposite sides of a web to within 50 microns.
14. To achieve coupling with sufficient rotational accuracy, the design team settled upon the use of an oversized bellows coupling to directly couple a high performance motor to the roller.

15. With respect to development of an adequate control loop, the design team pursued numerous different control loop structures, before settling upon the one disclosed in the present application.
16. The discovery of the problems and solutions discussed in paragraphs 7-15, consumed the efforts of the design team over the span of at least four years.
17. The problems and solutions referred to in paragraphs 7-15 are not within the scope of knowledge of one of ordinary skill in web handling.
18. I have read and understood the *Prix* reference. Based upon the teachings of the *Prix* reference, one of ordinary skill in the art of web handling would not be able to achieve registration between structures on opposite sides of a web to within 50 microns.
19. All statements made herein of my own knowledge are true, and all statements made herein on information and belief are believed to be true.
20. I understand that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. §1001), and may jeopardize the validity of the above-captioned application or any patent issuing thereon.

Dated: 9-21-06Signed: Daniel H. Carlson  
Daniel H. Carlson